

## 1.2A Dual High-Speed MOSFET Drivers

### Features:

- Low Cost
- Latch-Up Protected: Will Withstand 500 mA Reverse Output Current
- ESD Protected  $\pm 2\text{kV}$
- High Peak Output Current: 1.2A
- Wide Operating Range:
  - 4.5V to 16V
- High Capacitive Load Drive Capability: 1000 pF in 38 nsec
- Low Delay Time: 75 nsec Max
- Logic Input Threshold Independent of Supply Voltage
- Output Voltage Swing to Within 25 mV of Ground or  $V_{DD}$
- Low Output Impedance:  $8\Omega$

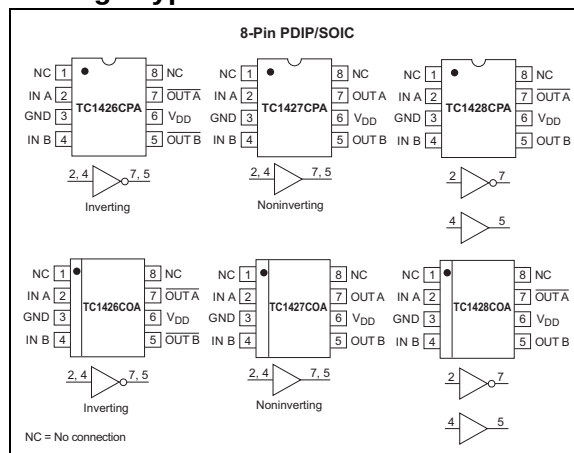
### Applications:

- Power MOSFET Drivers
- Switched Mode Power Supplies
- Pulse Transformer Drive
- Small Motor Controls
- Print Head Drive

### Device Selection Table

| Part Number | Package    | Temp. Range  |
|-------------|------------|--------------|
| TC1426COA   | 8-Pin SOIC | 0°C to +70°C |
| TC1426CPA   | 8-Pin PDIP | 0°C to +70°C |
| TC1427COA   | 8-Pin SOIC | 0°C to +70°C |
| TC1427CPA   | 8-Pin PDIP | 0°C to +70°C |
| TC1428COA   | 8-Pin SOIC | 0°C to +70°C |
| TC1428CPA   | 8-Pin PDIP | 0°C to +70°C |

### Package Type



### General Description:

The TC1426/TC1427/TC1428 are a family of 1.2A dual high-speed drivers. CMOS fabrication is used for low-power consumption and high efficiency.

These devices are fabricated using an epitaxial layer to effectively short out the intrinsic parasitic transistor responsible for CMOS latch-up. They incorporate a number of other design and process refinements to increase their long-term reliability.

The TC1426 is compatible with the bipolar DS0026, but only draws 1/5 of the quiescent current. The TC1426/TC1427/TC1428 are also compatible with the TC426/TC427/TC428, but with 1.2A peak output current rather than the 1.5A of the TC426/TC427/TC428 devices.

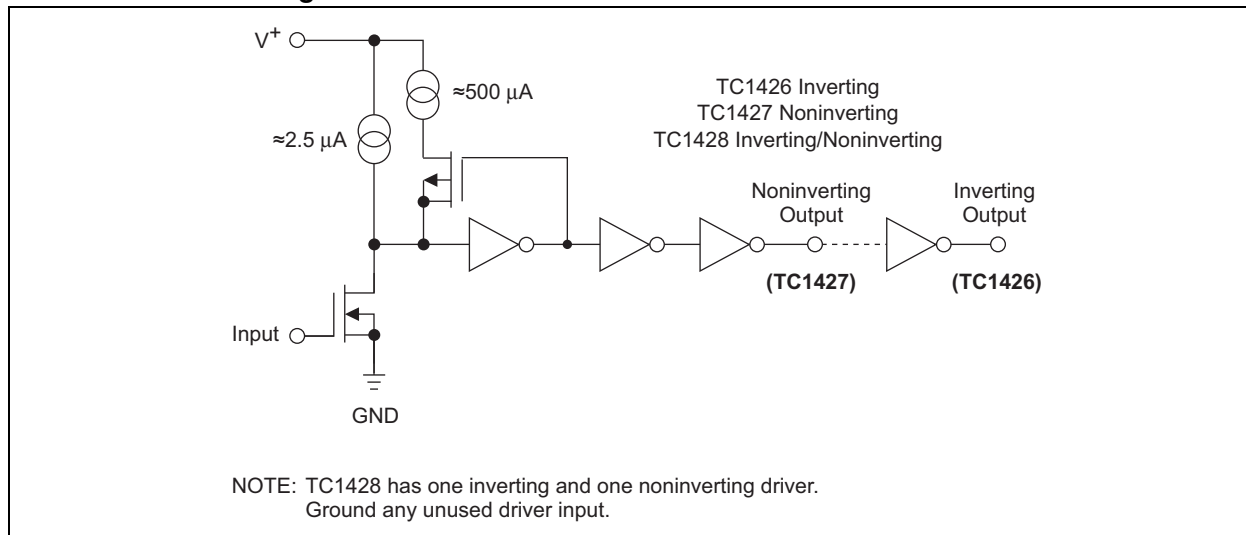
Other compatible drivers are the TC4426/TC4427/TC4428 and the TC4426A/TC4427A/TC4428A. The TC4426/TC4427/TC4428 have the added feature that the inputs can withstand negative voltage up to 5V with diode protection circuits. The TC4426A/TC4427A/TC4428A have matched input to output leading edge and falling edge delays,  $t_{D1}$  and  $t_{D2}$ , for processing short duration pulses in the 25 nanoseconds range. All of the above drivers are pin compatible.

The high-input impedance TC1426/TC1427/TC1428 drivers are CMOS/TTL input-compatible, do not require the speed-up needed by the bipolar devices, and can be directly driven by most PWM ICs.

This family of devices is available in inverting and non-inverting versions. Specifications have been optimized to achieve low-cost and high-performance devices, well-suited for the high-volume manufacturer.

# TC1426/TC1427/TC1428

## Functional Block Diagram



# TC1426/TC1427/TC1428

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings\*

|                                             |                                 |
|---------------------------------------------|---------------------------------|
| Supply Voltage .....                        | +18V                            |
| Input Voltage, Any Terminal<br>.....        | $V_{DD} + 0.3V$ to $GND - 0.3V$ |
| Power Dissipation ( $T_A \leq 70^\circ C$ ) |                                 |
| PDIP .....                                  | 730 mW                          |
| SOIC .....                                  | 470 mW                          |
| Derating Factor                             |                                 |
| PDIP .....                                  | 8 mW/ $^\circ C$                |
| SOIC .....                                  | 4 mW/ $^\circ C$                |
| Operating Temperature Range                 |                                 |
| C Version .....                             | $0^\circ C$ to $+70^\circ C$    |
| Storage Temperature Range .....             | $-65^\circ C$ to $+150^\circ C$ |

\*Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

## TC1426/TC1427/TC1428 ELECTRICAL SPECIFICATIONS

| Electrical Characteristics: $T_A = +25^\circ C$ , with $4.5V \leq V_{DD} \leq 16V$ , unless otherwise noted. |                                               |                  |         |          |          |                                                            |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------|---------|----------|----------|------------------------------------------------------------|
| Symbol                                                                                                       | Parameter                                     | Min              | Typ     | Max      | Units    | Test Conditions                                            |
| <b>Input</b>                                                                                                 |                                               |                  |         |          |          |                                                            |
| $V_{IH}$                                                                                                     | Logic 1, High Input Voltage                   | 3                | —       | —        | V        |                                                            |
| $V_{IL}$                                                                                                     | Logic 0, Low Input Voltage                    | —                | —       | 0.8      | V        |                                                            |
| $I_{IN}$                                                                                                     | Input Current                                 | -1               | —       | 1        | $\mu A$  | $0V \leq V_{IN} \leq V_{DD}$                               |
| <b>Output</b>                                                                                                |                                               |                  |         |          |          |                                                            |
| $V_{OH}$                                                                                                     | High Output Voltage                           | $V_{DD} - 0.025$ | —       | —        | V        | Figure 3-1, Figure 3-2                                     |
| $V_{OL}$                                                                                                     | Low Output Voltage                            | —                | —       | 0.025    | V        | Figure 3-1, Figure 3-2                                     |
| $R_O$                                                                                                        | Output Resistance                             | —                | 12<br>8 | 18<br>12 | $\Omega$ | $I_{OUT} = 10\text{ mA}$ , $V_{DD} = 16V$                  |
| $I_{PK}$                                                                                                     | Peak Output Current                           | —                | 1.2     | —        | A        |                                                            |
| $I_{REV}$                                                                                                    | Latch-Up Current<br>Withstand Reverse Current | —                | >500    | —        | mA       |                                                            |
| <b>Switching Time (Note 1)</b>                                                                               |                                               |                  |         |          |          |                                                            |
| $t_R$                                                                                                        | Rise Time                                     | —                | —       | 35       | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_F$                                                                                                        | Fall Time                                     | —                | —       | 25       | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_{D1}$                                                                                                     | Delay Time                                    | —                | —       | 75       | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_{D2}$                                                                                                     | Delay Time                                    | —                | —       | 75       | nsec     | Figure 3-1, Figure 3-2                                     |
| <b>Power Supply</b>                                                                                          |                                               |                  |         |          |          |                                                            |
| $I_S$                                                                                                        | Power Supply Current                          | —                | —       | 9<br>0.5 | mA       | $V_{IN} = 3V$ (Both Inputs)<br>$V_{IN} = 0V$ (Both Inputs) |

**Note 1:** Switching times ensured by design.

# TC1426/TC1427/TC1428

## TC1426/TC1427/TC1428 ELECTRICAL SPECIFICATIONS (CONTINUED)

**Electrical Characteristics:** Over operating temperature range with  $4.5V \leq V_{DD} \leq 16V$ , unless otherwise noted.

| Symbol                         | Parameter                                     | Min              | Typ      | Max       | Units    | Test Conditions                                            |
|--------------------------------|-----------------------------------------------|------------------|----------|-----------|----------|------------------------------------------------------------|
| <b>Input</b>                   |                                               |                  |          |           |          |                                                            |
| $V_{IH}$                       | Logic 1, High Input Voltage                   | 3                | —        | —         | V        |                                                            |
| $V_{IL}$                       | Logic 0, Low Input Voltage                    | —                | —        | 0.8       | V        |                                                            |
| $I_{IN}$                       | Input Current                                 | -10              | —        | 10        | $\mu A$  | $0V \leq V_{IN} \leq V_{DD}$                               |
| <b>Output</b>                  |                                               |                  |          |           |          |                                                            |
| $V_{OH}$                       | High Output Voltage                           | $V_{DD} - 0.025$ | —        | —         | V        | Figure 3-1, Figure 3-2                                     |
| $V_{OL}$                       | Low Output Voltage                            | —                | —        | 0.025     | V        | Figure 3-1, Figure 3-2                                     |
| $R_O$                          | Output Resistance                             | —                | 15<br>10 | 23<br>18  | $\Omega$ | $I_{OUT} = 10 \text{ mA}$ , $V_{DD} = 16V$                 |
| $I_{REV}$                      | Latch-Up Current<br>Withstand Reverse Current | —                | >500     | —         | mA       |                                                            |
| <b>Switching Time (Note 1)</b> |                                               |                  |          |           |          |                                                            |
| $t_R$                          | Rise Time                                     | —                | —        | 60        | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_F$                          | Fall Time                                     | —                | —        | 40        | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_{D1}$                       | Delay Time                                    | —                | —        | 125       | nsec     | Figure 3-1, Figure 3-2                                     |
| $t_{D2}$                       | Delay Time                                    | —                | —        | 125       | nsec     | Figure 3-1, Figure 3-2                                     |
| <b>Power Supply</b>            |                                               |                  |          |           |          |                                                            |
| $I_S$                          | Power Supply Current                          | —                | —        | 13<br>0.7 | mA       | $V_{IN} = 3V$ (Both Inputs)<br>$V_{IN} = 0V$ (Both Inputs) |

**Note 1:** Switching times ensured by design.

## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

**TABLE 2-1: PIN FUNCTION TABLE**

| Pin No.<br>(8-Pin PDIP,<br>SOIC) | Symbol          | Description                                       |
|----------------------------------|-----------------|---------------------------------------------------|
| 1                                | NC              | No connection.                                    |
| 2                                | IN A            | Control input A, TTL/CMOS compatible logic input. |
| 3                                | GND             | Ground.                                           |
| 4                                | IN B            | Control input B, TTL/CMOS compatible logic input. |
| 5                                | OUT B           | Output B, CMOS totem-pole output.                 |
| 6                                | V <sub>DD</sub> | Supply input, 4.5V to 16V.                        |
| 7                                | OUT A           | Output A, CMOS totem-pole output.                 |
| 8                                | NC              | No connection.                                    |

# TC1426/TC1427/TC1428

## 3.0 APPLICATIONS INFORMATION

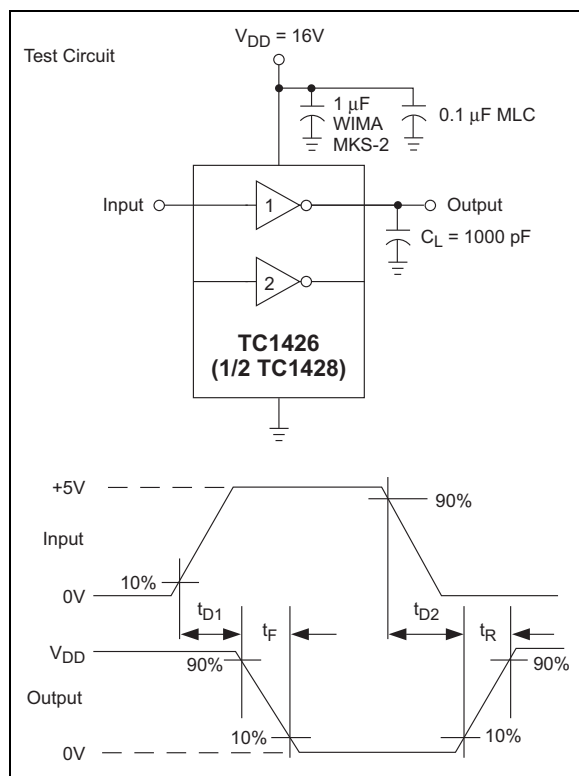
### 3.1 SUPPLY BYPASSING

Large currents are required to charge and discharge capacitive loads quickly. For example, charging a 1000 pF load to 16V in 25 nsec requires a 0.8A current from the device's power supply.

To ensure low supply impedance over a wide frequency range, a parallel capacitor combination is recommended for supply bypassing. Low-inductance ceramic MLC capacitors with short lead lengths (<0.5-in.) should be used. A 1.0  $\mu$ F film capacitor in parallel with one or two 0.1  $\mu$ F ceramic MLC capacitors normally provides adequate bypassing.

### 3.2 GROUNDING

The TC1426 and TC1428 contain inverting drivers. Individual ground returns for the input and output circuits or a ground plane should be used. This will reduce negative feedback that causes degradation in switching speed characteristics.



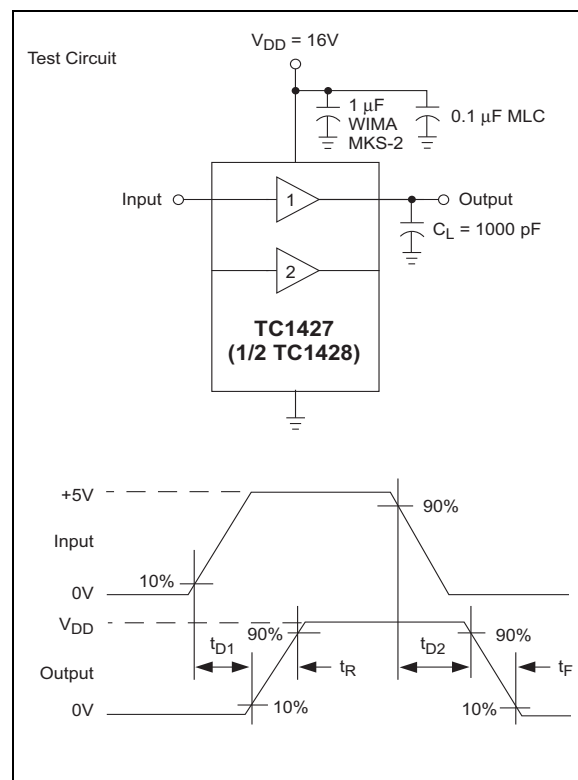
**FIGURE 3-1:** Inverting Driver Switching Time

### 3.3 INPUT STAGE

The input voltage level changes the no-load or quiescent supply current. The N-channel MOSFET input stage transistor drives a 2.5 mA current source load. With a logic '1' input, the maximum quiescent supply current is 9 mA. Logic '0' input level signals reduce quiescent current to 500  $\mu$ A maximum. **Unused driver inputs must be connected to VDD or GND.** Minimum power dissipation occurs for logic '0' inputs for the TC1426/TC1427/TC1428.

The drivers are designed with 100 mV of hysteresis. This provides clean transitions and minimizes output stage current spiking when changing states. Input voltage thresholds are approximately 1.5V, making a logic '1' input any voltage greater than 1.5V up to VDD. Input current is less than 1  $\mu$ A over this range.

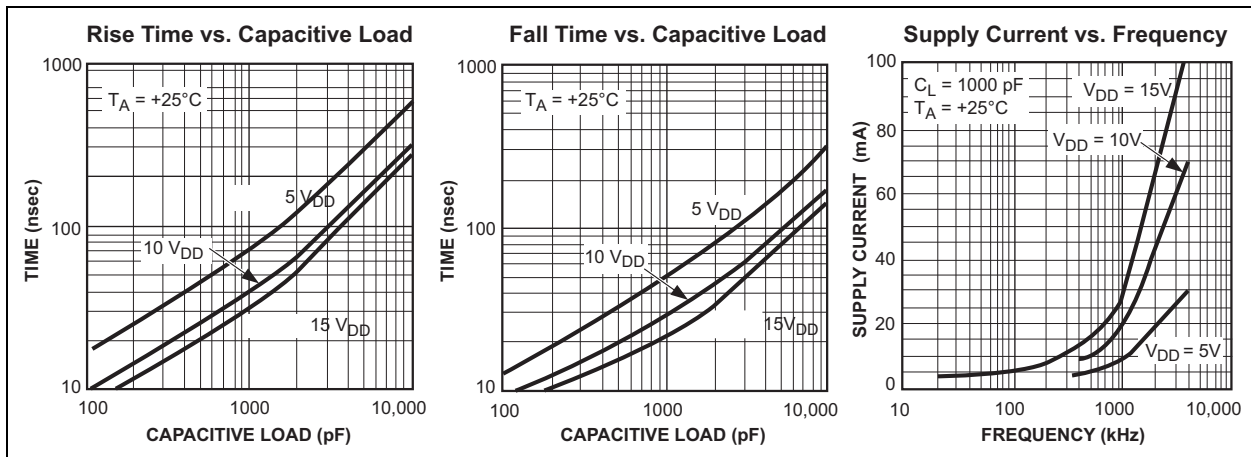
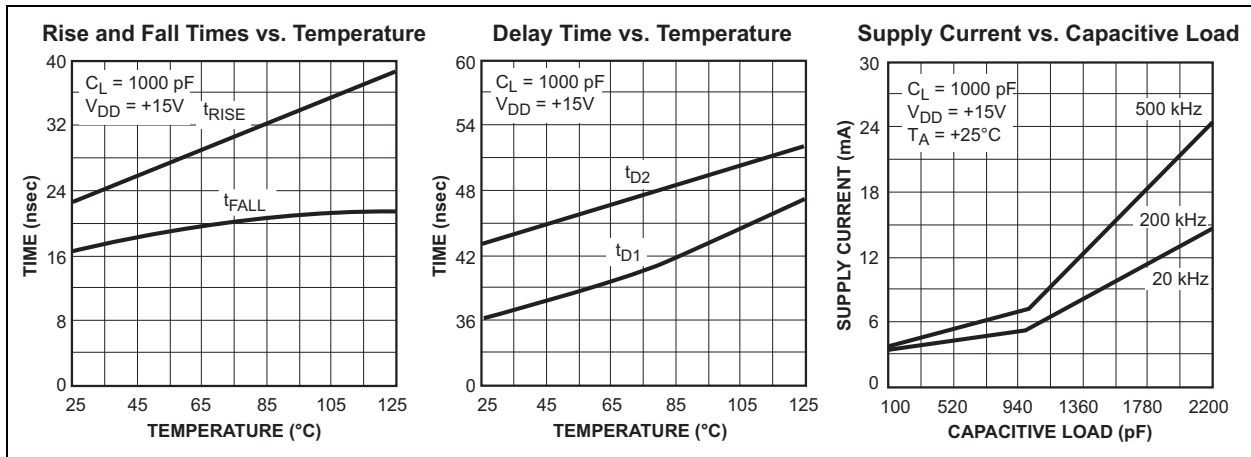
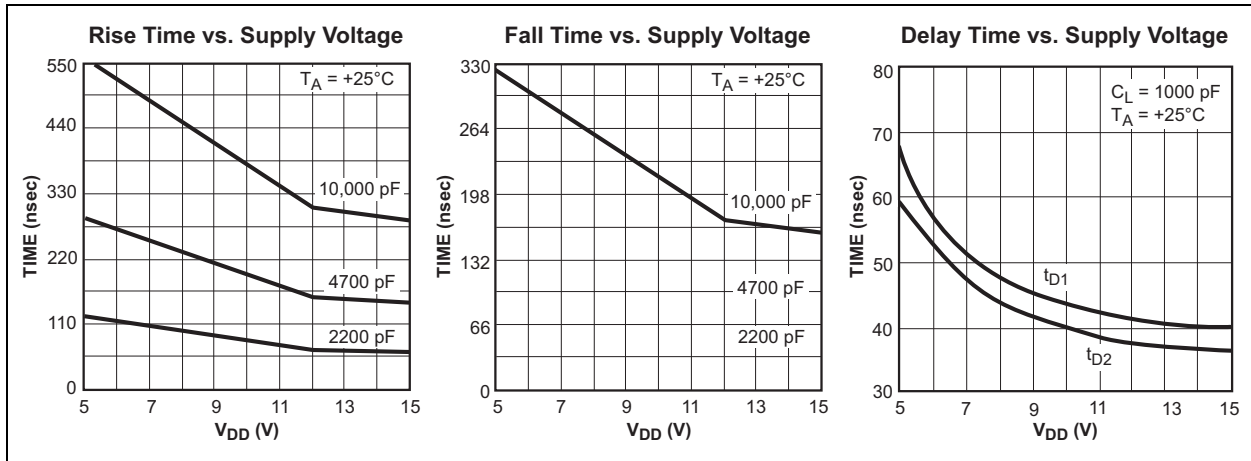
The TC1426/TC1427/TC1428 may be directly driven by the TL494, SG1526/27, TC38C42, TC170 and similar switch-mode power supply integrated circuits.



**FIGURE 3-2:** Noninverting Driver Switching Time

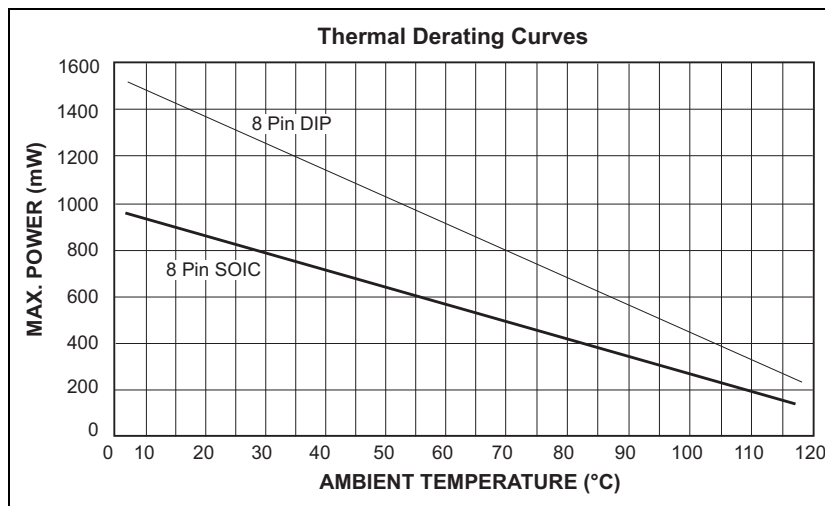
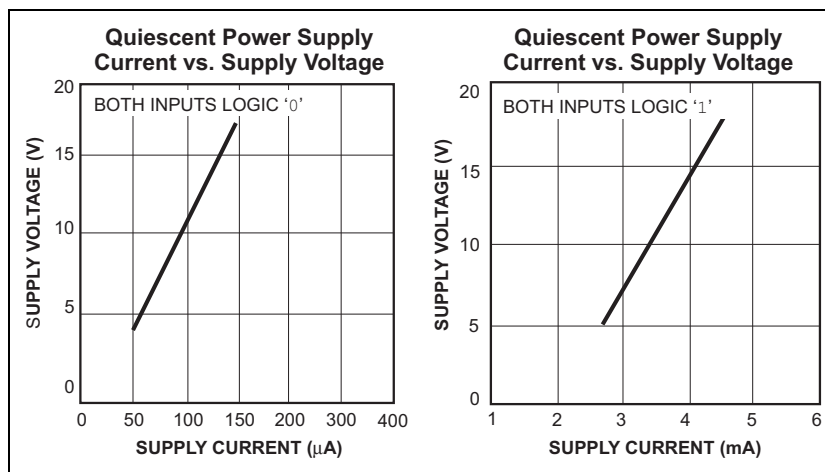
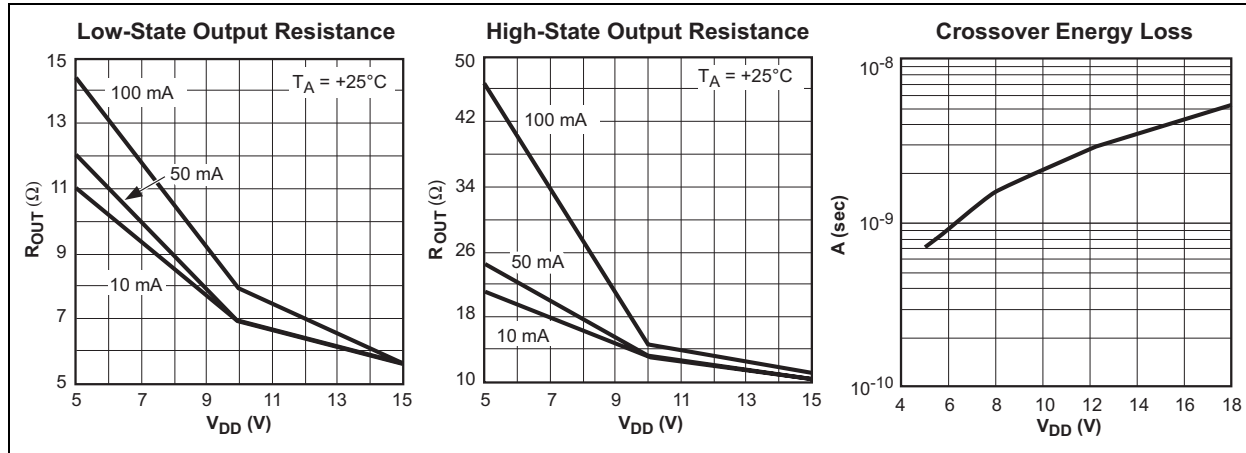
## 4.0 TYPICAL CHARACTERISTICS

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.



# TC1426/TC1427/TC1428

## TYPICAL CHARACTERISTICS (CONTINUED)



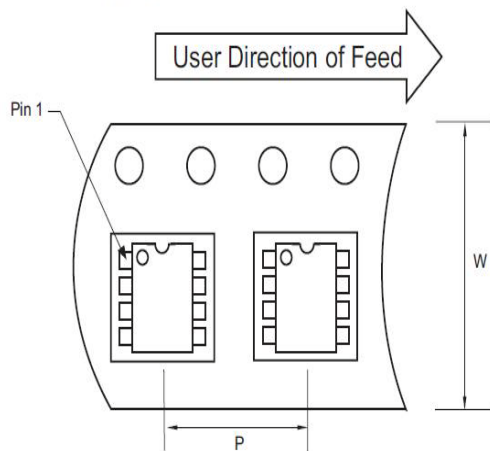
## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information

Package marking data not available at this time.

### 5.2 Taping Form

Component Taping Orientation for 8-Pin MSOP Devices

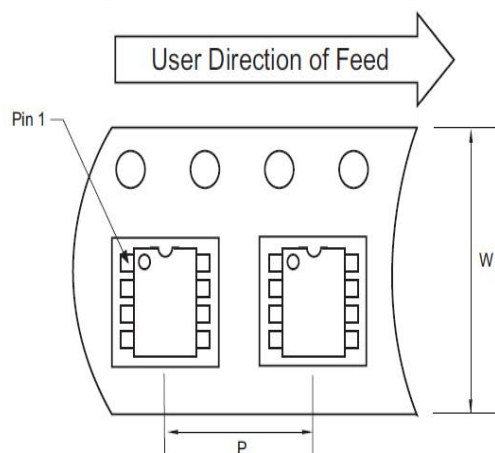


Standard Reel Component Orientation  
for 713 Suffix Device

Carrier Tape, Number of Components Per Reel and Reel Size

| Package    | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|------------|-------------------|-----------|--------------------|-----------|
| 8-Pin MSOP | 12 mm             | 8 mm      | 2500               | 13 in     |

Component Taping Orientation for 8-Pin SOIC (Narrow) Devices



Standard Reel Component Orientation  
for 713 Suffix Device

Carrier Tape, Number of Components Per Reel and Reel Size

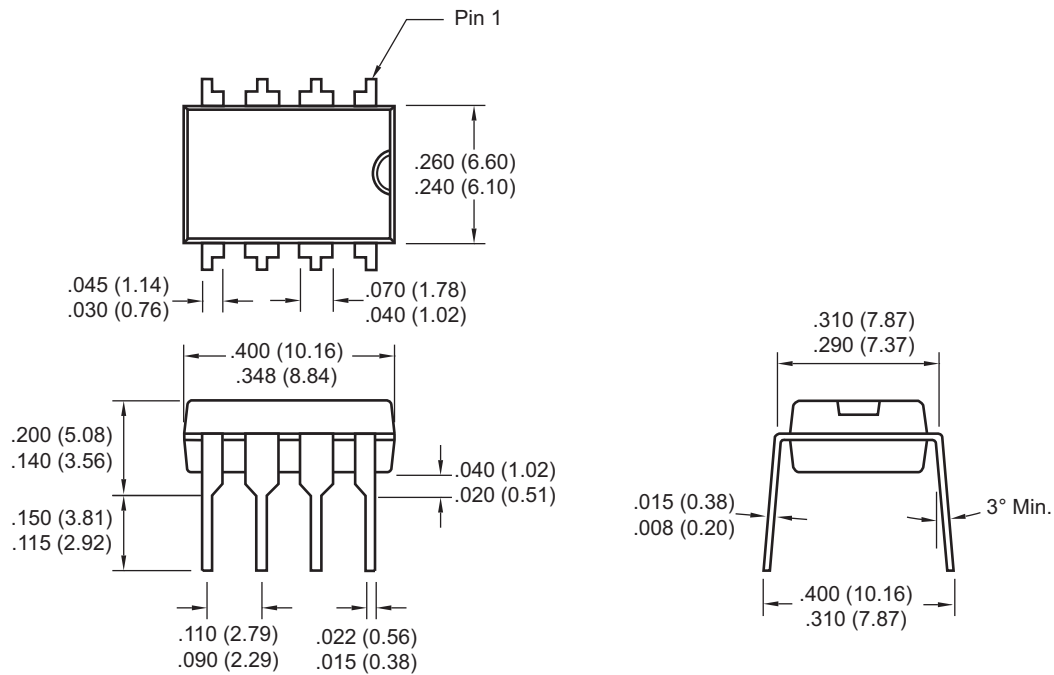
| Package        | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|----------------|-------------------|-----------|--------------------|-----------|
| 8-Pin SOIC (N) | 12 mm             | 8 mm      | 2500               | 13 in     |

# TC1426/TC1427/TC1428

## 5.3 Package Dimensions

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

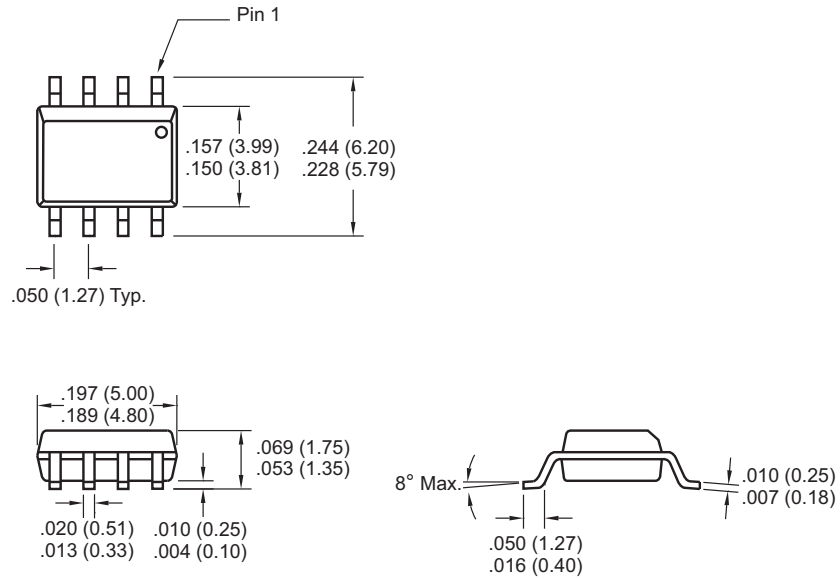
### 8-Pin Plastic DIP



Dimensions: inches (mm)

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## 8-Pin SOIC



Dimensions: inches (mm)

## 6.0 REVISION HISTORY

### Revision D (December 2012)

Added a note to each package outline drawing.

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# TC1426/TC1427/TC1428

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